

'Plastic recycling is a myth': what really happens to your rubbish?

You sort your recycling, leave it to be collected - and then what? From councils burning the lot to foreign landfill sites overflowing with British rubbish, Oliver Franklin-Wallis reports on a global waste crisis

Main image: 'Everything you own will one day become property of the £250bn global waste industry.' Composite: Guardian Design Team

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An alarm sounds, the blockage is cleared, and the line at Green Recycling in Maldon, Essex, rumbles back into life. A momentous river of garbage rolls down the conveyor: cardboard boxes, splintered skirting board, plastic bottles, crisp packets, DVD cases, printer cartridges, countless newspapers, including this one. Odd bits of junk catch the eye, conjuring little vignettes: a single discarded glove. A crushed Tupperware container, the meal inside uneaten. A photograph of a smiling child on an adult's shoulders. But they are gone in a moment. The line at Green Recycling handles up to 12 tonnes of waste an hour.

"We produce 200 to 300 tonnes a day," says Jamie Smith, Green Recycling's general manager, above the din. We are standing three storeys up on the green health-and-safety gangway, looking down the line. On the tipping floor, an excavator is grabbing clawfuls of trash from heaps and piling it into a spinning drum, which spreads it evenly across the conveyor. Along the belt, human workers pick and channel what is valuable (bottles, cardboard, aluminium cans) into sorting chutes.

"Our main products are paper, cardboard, plastic bottles, mixed plastics, and wood," says Smith, 40. "We're seeing a significant rise in boxes, thanks to Amazon." By the end of the line, the torrent has become a trickle. The waste stands stacked neatly in bales, ready to be loaded on to trucks. From there, it will go - well, that is when it gets complicated.

You drink a Coca-Cola, throw the bottle into the recycling, put the bins out on collection day and forget about it. But it doesn't disappear. Everything you own will one day become the property of this, the waste industry, a £250bn global enterprise determined to extract every last penny of value from what remains. It starts with materials recovery facilities (MRFs) such as this one, which sort waste into its constituent parts. From there, the materials enter a labyrinthine network of brokers and traders. Some of that happens in the UK, but much of it - about half of all paper and cardboard, and two-thirds of plastics - will be loaded on to container ships to be sent to Europe or Asia for recycling. Paper and cardboard goes to mills; glass is washed and re-used or smashed and melted, like metal and plastic. Food, and anything else, is burned or sent to landfill.

Or, at least, that's how it used to work. Then, on the first day of 2018, China, the world's largest market for recycled waste, essentially shut its doors. Under its National Sword policy, China

prohibited 24 types of waste from entering the country, arguing that what was coming in was too contaminated. The policy shift was partly attributed to the impact of a documentary, *Plastic China*, which went viral before censors erased it from China's internet. The film follows a family working in the country's recycling industry, where humans pick through vast dunes of western waste, shredding and melting salvageable plastic into pellets that can be sold to manufacturers. It is filthy, polluting work - and badly paid. The remainder is often burned in the open air. The family lives alongside the sorting machine, their 11-year-old daughter playing with a Barbie pulled from the rubbish.

For recyclers such as Smith, National Sword was a huge blow. "The price of cardboard has probably halved in the last 12 months," he says. "The price of plastics has plummeted to the extent that it isn't worth recycling. If China doesn't take plastic, we can't sell it." Still, that waste has to go somewhere. The UK, like most developed nations, produces more waste than it can process at home: 230m tonnes a year - about 1.1kg per person per day. (The US, the world's most wasteful nation, produces 2kg per person per day.) Quickly, the market began flooding any country that would take the trash: Thailand, Indonesia, Vietnam, countries with some of the world's highest rates of what researchers call "waste mismanagement" - rubbish left or burned in open landfills, illegal sites or facilities with inadequate reporting, making its final fate difficult to trace.

The present dumping ground of choice is Malaysia. In October last year, a Greenpeace Unearthed investigation found mountains of British and European waste in illegal dumps there: Tesco crisp packets, Flora tubs and recycling collection bags from three London councils. As in China, the waste is often burned or abandoned, eventually finding its way into rivers and oceans. In May, the Malaysian government began turning back container ships, citing public health concerns. Thailand and India have announced bans on the import of foreign plastic waste. But still the rubbish flows.



Plastic waste ready for inspection before being sent to Malaysia; the UK produces more refuse than it can process at home - about 1.1kg per person per day. Photograph: AFP/Getty Images

We want our waste hidden. Green Recycling is tucked away at the end of an industrial estate, surrounded by sound-deflecting metal boards. Outside, a machine called an Air Spectrum masks the acrid odour with the smell of cotton bedsheets. But, all of a sudden, the industry is under intense scrutiny. In the UK, recycling rates have stagnated in recent years, while National Sword and funding cuts have led to more waste being burned in incinerators and energy-from-waste plants. (Incineration, while often criticised for being polluting and an inefficient source of energy, is today preferred to landfill, which emits methane and can leach toxic chemicals.) Westminster council sent 82% of all household waste - including that put in recycling bins - for incineration in 2017/18. Some councils have debated giving up recycling altogether. And yet the UK is a successful recycling nation: 45.7% of all household waste is classed as recycled

(although that number indicates only that it is sent for recycling, not where it ends up.) In the US, that figure is 25.8%.

If you look at plastics, the picture is even bleaker. Of the 8.3bn tonnes of virgin plastic produced worldwide, only 9% has been recycled, according to a 2017 Science Advances paper entitled Production, Use And Fate Of All Plastics Ever Made. “I think the best global estimate is maybe we’re at 20% [per year] globally right now,” says Roland Geyer, its lead author, a professor of industrial ecology at the University of California, Santa Barbara. Academics and NGOs doubt those numbers, due to the uncertain fate of our waste exports. In June, one of the UK’s largest waste companies, Biffa, was found guilty of attempting to ship used nappies, sanitary towels and clothing abroad in consignments marked as waste paper. “I think there’s a lot of creative accounting going on to push the numbers up,” Geyer says.

“It’s really a complete myth when people say that we’re recycling our plastics,” says Jim Puckett, the executive director of the Seattle-based Basel Action Network, which campaigns against the illegal waste trade. “It all sounded good. ‘It’s going to be recycled in China!’ I hate to break it to everyone, but these places are routinely dumping massive amounts of [that] plastic and burning it on open fires.”

Recycling is as old as thrift. The Japanese were recycling paper in the 11th century; medieval blacksmiths made armour from scrap metal. During the second world war, scrap metal was made into tanks and women’s nylons into parachutes. “The trouble started when, in the late 70s, we began trying to recycle household waste,” says Geyer. This was contaminated with all sorts of undesirables: non-recyclable materials, food waste, oils and liquids that rot and spoil the bales.

At the same time, the packaging industry flooded our homes with cheap plastic: tubs, films, bottles, individually shrink-wrapped vegetables. Plastic is where recycling gets most controversial. Recycling aluminium, say, is straightforward, profitable and environmentally sound: making a can from recycled aluminium reduces its carbon footprint by up to 95%. But with plastic, it is not that simple. While virtually all plastics can be recycled, many aren’t because the process is expensive, complicated and the resulting product is of lower quality than what you put in. The carbon-reduction benefits are also less clear. “You ship it around, then you have to wash it, then you have to chop it up, then you have to re-melt it, so the collection and recycling itself has its own environmental impact,” says Geyer.



A materials recovery facility in Milton Keynes where waste is sorted. In the UK, there are 28 different recycling labels that can appear on packaging. Photograph: Alamy

Household recycling requires sorting at a vast scale. This is why most developed countries have colour-coded bins: to keep the end product as pure as possible. In the UK, Recycle Now lists 28 different recycling labels that can appear on packaging. There is the mobius loop (three twisted arrows), which indicates a product can technically be recycled; sometimes that symbol contains a number between one and seven, indicating the plastic resin from which the object is made. There is the green dot (two green arrows embracing), which indicates that the producer has contributed to a European recycling scheme. There are labels that say “Widely Recycled” (acceptable by 75% of local councils) and “Check Local Recycling” (between 20% and 75% of councils).

Since National Sword, sorting has become even more crucial, as overseas markets demand higher-quality material. “They don’t want to be the world’s dumping ground, quite rightly,” Smith says, as we walk along the Green Recycling line. About halfway, four women in hi-vis and caps pull out large chunks of cardboard and plastic films, which machines struggle with. There is a low rumble in the air and a thick layer of dust on the gangway. Green Recycling is a commercial MRF: it takes waste from schools, colleges and local businesses. That means lower volume, but better margins, as the company can charge clients directly and maintain control over what it collects. “The business is all about turning straw into gold,” says Smith, referencing Rumpelstiltskin. “But it’s hard - and it’s become a lot harder.”

Towards the end of the line is the machine that Smith hopes will change that. Last year, Green Recycling became the first MRF in the UK to invest in Max, a US-made, artificially intelligent sorting machine. Inside a large clear box over the conveyor, a robotic suction arm marked FlexPicker™ is zipping back and forth over the belt, picking tirelessly. “He’s looking for plastic bottles first,” Smith says. “He does 60 picks a minute. Humans will pick between 20 and 40, on a good day.” A camera system identifies the waste rolling by, displaying a detailed breakdown on a nearby screen. The machine is intended not to replace humans, but to augment them. “He’s picking three tonnes of waste a day that otherwise our human guys would have to leave,” Smith says. In fact, the robot has created a new human job to maintain it: this is done by Danielle, whom the crew refer to as “Max’s mum”. The benefits of automation, Smith says, are twofold: more material to sell and less waste that the company needs to pay to have burned afterwards. Margins are thin and landfill tax is £91 a tonne.

Smith is not alone in putting his faith in technology. With consumers and the government outraged at the plastics crisis, the waste industry is scrambling to solve the problem. One great hope is chemical recycling: turning problem plastics into oil or gas through industrial processes. “It recycles the kind of plastics that mechanical recycling can’t look at: the pouches, the sachets, the black plastics,” says Adrian Griffiths, the founder of Swindon-based Recycling Technologies. The idea found its way to Griffiths, a former management consultant, by accident, after a mistake in a Warwick University press release. “They said they could turn any old plastic back into a monomer. At the time, they couldn’t,” Griffiths says. Intrigued, Griffiths got in touch. He ended up partnering with the researchers to launch a company that could do this.

At Recycling Technologies’ pilot plant in Swindon, plastic (Griffiths says it can process any type) is fed into a towering steel cracking chamber, where it is separated at extremely high temperatures into gas and an oil, plaxx, which can be used as a fuel or feedstock for new plastic. While the global mood has turned against plastic, Griffiths is a rare defender of it. “Plastic packaging has actually done an incredible service for the world, because it has reduced the amount of glass, metal and paper that we were using,” he says. “The thing that worries me more than the plastic problem is global warming. If you use more glass, more metal, those

materials have a much higher carbon footprint.” The company recently launched a trial scheme with Tesco and is already working on a second facility, in Scotland. Eventually, Griffiths hopes to sell the machines to recycling facilities worldwide. “We need to stop shipping recycling abroad,” he says. “No civilised society should be getting rid of its waste to a developing country.”

There is cause for optimism: in December 2018, the UK government published a comprehensive new waste strategy, partly in response to National Sword. Among its proposals: a tax on plastic packaging containing less than 30% recycled material; a simplified labelling system; and means to force companies to take responsibility for the plastic packaging they produce. They hope to force the industry to invest in recycling infrastructure at home.

Meanwhile, the industry is being forced to adapt: in May, 186 countries passed measures to track and control the export of plastic waste to developing countries, while more than 350 companies have signed a global commitment to eliminate the use of single-use plastics by 2025.

Yet such is the torrent of humanity’s refuse that these efforts may not be enough. Recycling rates in the west are stalling and packaging use is set to soar in developing countries, where recycling rates are low. If National Sword has shown us anything, it is that recycling - while needed - simply isn’t enough to solve our waste crisis.

Perhaps there is an alternative. Since Blue Planet II brought the plastic crisis to our attention, a dying trade is having a resurgence in Britain: the milkman. More of us are choosing to have milk bottles delivered, collected and re-used. Similar models are springing up: zero-waste shops that require you to bring your own containers; the boom in refillable cups and bottles. It is as if we have remembered that the old environmental slogan “Reduce, re-use, recycle” wasn’t only catchy, but listed in order of preference.

Tom Szaky wants to apply the milkman model to almost everything you buy. The bearded, shaggy-haired Hungarian-Canadian is a veteran of the waste industry: he founded his first recycling startup as a student at Princeton, selling worm-based fertiliser out of re-used bottles. That company, TerraCycle, is now a recycling giant, with operations in 21 countries. In 2017, TerraCycle worked with Head & Shoulders on a shampoo bottle made from recycled ocean plastics. The product launched at the World Economic Forum in Davos and was an immediate hit. Procter & Gamble, which makes Head & Shoulders, was keen to know what was next, so Szaky pitched something far more ambitious.

The result is Loop, which launched trials in France and the US this spring and will arrive in Britain this winter. It offers a variety of household products - from manufacturers including P&G, Unilever, Nestlé and Coca-Cola - in reusable packaging. The items are available online or through exclusive retailers. Customers pay a small deposit, and the used containers are eventually collected by a courier or dropped off in store (Walgreens in the US, Tesco in the UK), washed, and sent back to the producer to be refilled. “Loop is a not a product company; it’s a waste management company,” says Szaky. “We’re just looking at waste before it begins.”

Many of the Loop designs are familiar: refillable glass bottles of Coca-Cola and Tropicana; aluminium bottles of Pantene. But others are being rethought entirely. “By moving from disposable to reusable, you unlock epic design opportunities,” says Szaky. For example: Unilever is working on toothpaste tablets that dissolve into paste under running water; Häagen-Dazs ice-cream comes in a stainless steel tub that stays cold long enough for picnics. Even the deliveries come in a specially designed insulated bag, to cut down on cardboard.



At Recycling Technologies in Swindon, nearly all plastics can be turned into plaxx, an oil that can be used to make new plastic.
Photograph: Recycling Technologies Ltd

Tina Hill, a Paris-based copywriter, signed up to Loop soon after its launch in France. “It’s super-easy,” she says. “It’s a small deposit, €3 [per container]. What I like about it is that they have things I already use: olive oil, washing pods.” Hill describes herself as “pretty green: we recycle anything that can be recycled, we buy organic”. By combining Loop with shopping at local zero-waste stores, Hills has helped her family radically reduce its reliance on single-use packaging. “The only downside is that the prices can be a little high. We don’t mind spending a little bit more to support the things that you believe in, but on some things, like pasta, it’s prohibitive.”

A major advantage to Loop’s business model, Szaky says, is that it forces packaging designers to prioritise durability over disposability. In future, Szaky anticipates that Loop will be able to email users warnings for expiry dates and other advice to reduce their waste footprint. The milkman model is about more than just the bottle: it makes us think about what we consume and what we throw away. “Garbage is something that we want out of sight and mind - it’s dirty, it’s gross, it smells bad,” says Szaky.

That is what needs to change. It is tempting to see plastic piled up in Malaysian landfills and assume recycling is a waste of time, but that isn’t true. In the UK, recycling is largely a success story, and the alternatives - burning our waste or burying it - are worse. Instead of giving up on recycling, Szaky says, we should all use less, re-use what we can and treat our waste like the waste industry sees it: as a resource. Not the ending of something, but the beginning of something else.

“We don’t call it waste; we call it materials,” says Green Recycling’s Smith, back in Maldon. Down in the yard, a haulage truck is being loaded with 35 bales of sorted cardboard. From here, Smith will send it to a mill in Kent for pulping. It will be new cardboard boxes within the fortnight - and someone else’s rubbish soon after.

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